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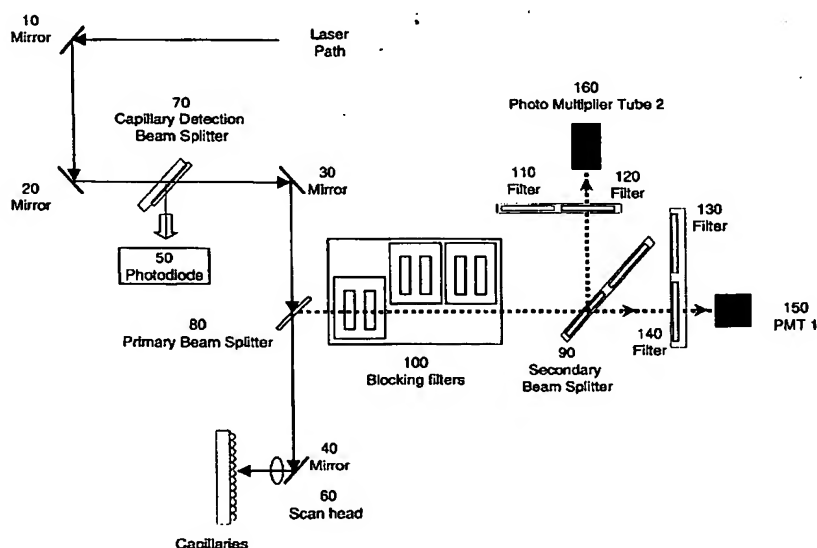
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(81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.**

(84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI,**

[Continued on next page]

(54) Title: **MULTIPLEXED CAPILLARY ELECTROPHORESIS SYSTEMS**



(57) Abstract: Multi-capillary systems for high-throughput electrophoretic separation and detection of biomolecules are disclosed. One embodiment of the invention uses galactomannans as a size-sieving matrix for multi-channel electrophoretic separations of biomolecules. Multi-color detection for the simultaneous analysis of controls and standards in the same channels as the samples, and endogenous fluorescence detection are also disclosed (Figure 6B). Another embodiment of the invention is a two dimensional system for separation of complex samples, using multiplexed capillary electrophoresis system as the second dimension, with a fraction collection step connecting the two separation steps. The systems allow for separations to be accomplished with a highly parallel manner, or in a two-dimensional format.



WO 03/087773 A3

WO 03/087773 A3



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24 December 2003

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— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:  
AMERSHAM BIOSCIENCES CORP  
800 CENTENNIAL AVENUE  
PISCATAWAY, NJ 08855

PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT  
OR THE DECLARATION

(PCT Rule 44.1)



Date of Mailing (day/month/year) <b>29 SEP 2003</b>	
Applicant's or agent's file reference PB0217	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US03/11454	International filing date (day/month/year) 14 April 2003 (14.04.2003)
Applicant AMERSHAM BIOSCIENCES (SV) CORP	

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

**Where?** Directly to the International Bureau of WIPO, 34, chemin des Colombettes  
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.  
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90 bis.1 and 90 bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer  ALEX NOGUEROLA Telephone No. (703) 308-0661
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Form PCT/ISA/220 (April 2002)

(See notes on accompanying sheet)

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PB0217	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US03/11454	International filing date (day/month/year) 14 April 2003 (14.04.2003)	(Earliest) Priority Date (day/month/year) 12 April 2002 (12.04.2002)
Applicant AMERSHAM BIOSCIENCES (SV) CORP		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

#### 1. Basis of the Report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the abstract,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 6B



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/11454

## Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

Multi-capillary systems for high-throughput electrophoretic separation and detection of biomolecules are disclosed. One embodiment of the invention uses galactomannans as a size-sieving matrix for multi-channel electrophoretic separations of biomolecules. Multi-color detection for the simultaneous analysis of controls and standards in the same channels as the samples, and endogenous fluorescence detection are also disclosed (Figure 6B). Another embodiment of the invention is a two dimensional system for separation of complex samples, using multiplexed capillary electrophoresis system as the second dimension, with a fraction collection step connecting the two separation steps. The systems allow for separations to be accomplished in a highly parallel manner, or in a two-dimensional format.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/11454

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) : G01N 27/447,453 US CL : 204/451,601 According to International Patent Classification (IPC) or to both national classification and IPC																				
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 204/451,601,453,455,604,605  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Please See Continuation Sheet																				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>																				
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																		
Y	US 6,365,024 B1 (LI et al.) 02 April 2002, the abstract; Figures 1, 2A, and 2B; column 14, lines 48-50; and column 17, lines 57-65.	1-4, 11, 12, 13																		
Y	KARIM et al. Size-dependnet separation of proteins in the presence of sodium dodecyl sulfate and dextran in capillary electrophoresis: Effect of molecular weight of dextran. Electrophoresis 1994, 15, 15331-1534, the abstract.	2, 3, 8, 9																		
Y	DOLNIK et al. Galactomannans as a sieving matrix in capillary electrophoresis. Electrophoresis 2001, 22, 707-719, the abstract.	4, 10, 20																		
Y	GOOIJER et al. Laser spectroscopy in analytical chemistry: light on the next millennium, Analytica Chimica Acta 400 (1999) 281-295, see section 3.1.3 Multiphoton excited LIF, which begins on page 286.	5-7																		
X,E	US 6,537,432 B1 (SCHNEIDER et al.) 25 March 2003, the abstract; Figure 1; and column 22, lines 8-48.	14, 18, 19																		
X	ISSAQ et al. Multidimensional high performance liquid chromatography - capillary electrophoresis separation of a protein digest: An update, Electrophoresis 2001, 22, 1133-1135, the abstract; and the secon dcolumn on page 1133.	14, 16, 18																		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.																				
<table border="0"><tr><td>* Special categories of cited documents:</td><td>"T"</td><td>later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td></tr><tr><td>"A" document defining the general state of the art which is not considered to be of particular relevance</td><td>"X"</td><td>document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td></tr><tr><td>"E" earliest application or patent published on or after the international filing date</td><td>"Y"</td><td>document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td></tr><tr><td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td><td>"&amp;"</td><td>document member of the same patent family</td></tr><tr><td>"O" document referring to an oral disclosure, use, exhibition or other means</td><td></td><td></td></tr><tr><td>"P" document published prior to the international filing date but later than the priority date claimed</td><td></td><td></td></tr></table>			* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earliest application or patent published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means			"P" document published prior to the international filing date but later than the priority date claimed		
* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention																		
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone																		
"E" earliest application or patent published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art																		
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family																		
"O" document referring to an oral disclosure, use, exhibition or other means																				
"P" document published prior to the international filing date but later than the priority date claimed																				
Date of the actual completion of the international search 07 September 2003 (07.09.2003)		Date of mailing of the international search report 29 SEP 2003																		
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230		Authorized officer ALEX NOGUEROLA Telephone No. (703) 308-0661																		

# INTERNATIONAL SEARCH REPORT

PCT/US03/11454

## C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	US 6,387,234 B1 (YEUNG et al.) 14 May 2002, the abstract and Figure 3.	14, 18, 19

INTERNATIONAL SEARCH REPORT

PCT/US03/11454

**Continuation of B. FIELDS SEARCHED Item 3:**

CAPLUS

search terms: titanium sapphire, Ti:sapphire,siev?, separat?, polymer, dextran, galactomannans, guaran,tandem, hybrid,comined, conjoined,hybrid,HPLC,EPLC,chromatography,field fractionation,array,microtitre